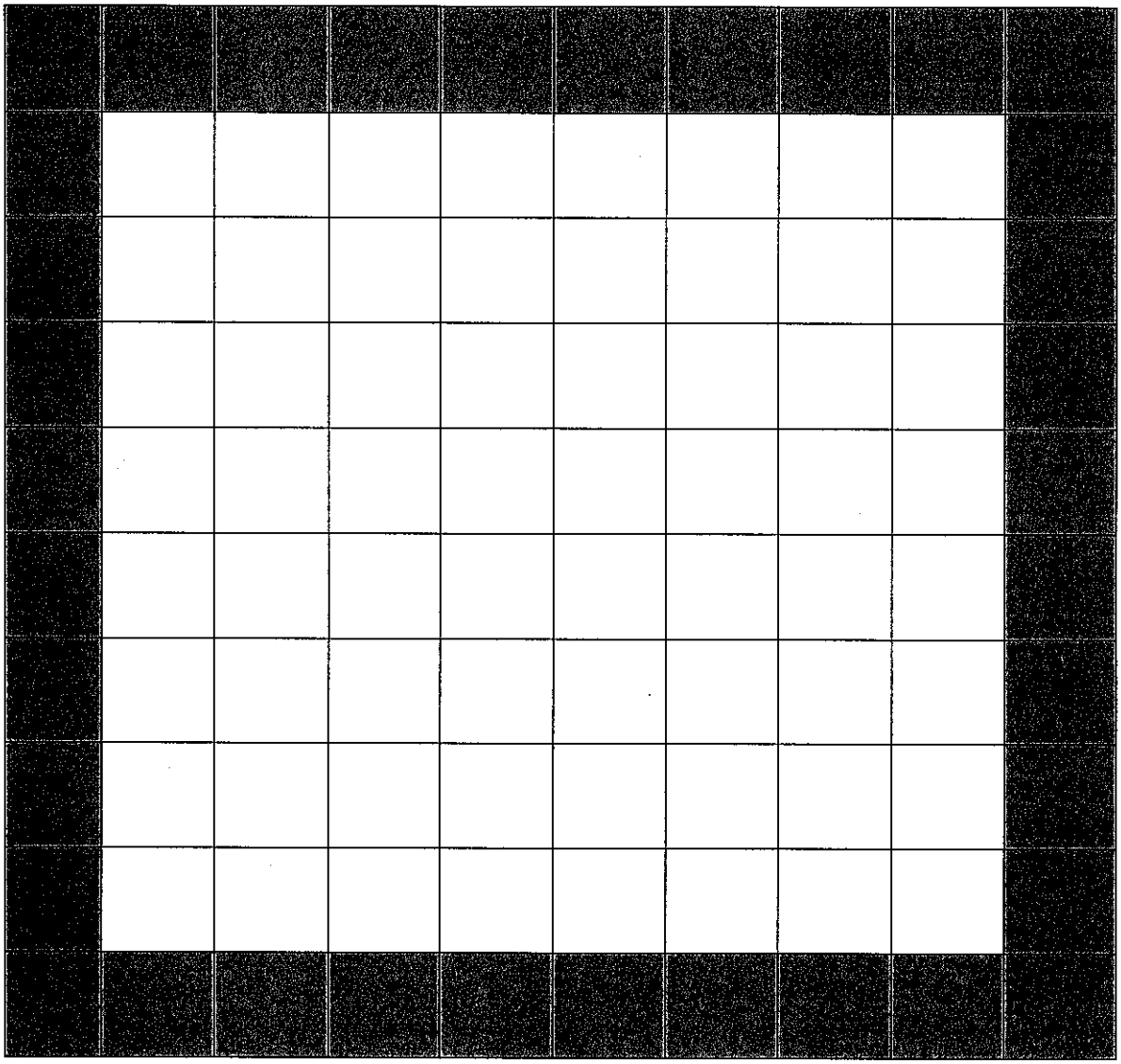
Lenses on Learning

The Secondary Series

The Border Problem[1]



Without counting every tile, how can you determine how many squares are on the outside border of this 10-by-10 figure?

Share your solution with a neighbor, then we will compare strategies as a whole group.

[1] Adapted from the *Connecting Mathematical Ideas: Middle School Video Cases to Support Teaching and Learning* materials, developed by Jo Boaler and Cathy Humphries, distributed by Heinemann.

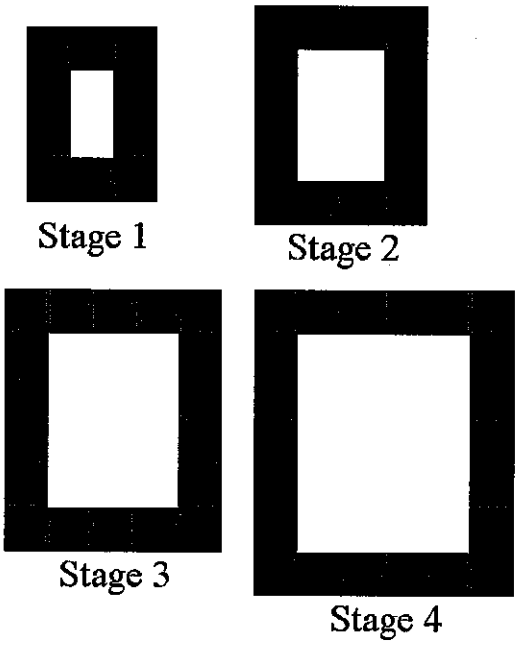
1. Use two strategies different than your own to find out how many tiles would be on the border of a 6 x 6 grid. How about a 50 x 50 grid? An n x n grid?

2. Come up with several ways to figure out the number of tiles in a border, when given the number of tiles on the side of any square. Write an expression for each of the approaches you came up with.

3. In what ways can you show that each of these expressions is equivalent?

4. What methods can be employed to determine whether the rule always works?

THE BORDER PROBLEM - CONTINUED



A. HOW MANY TILES ARE NEEDED FOR A MODEL AT DESIGN 5? 11?

B. EXPLAIN HOW YOU DETERMINED THE NUMBER NEEDED FOR DESIGN 11.

C. DETERMINE AN EXPRESSION FOR THE NUMBER OF TILES IN A MODEL OF ANY DESIGN, *N*.